In vitro and in vivo evaluation of poly (caprolactonefumarate) nanoparticles

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Abstract:

In this study, the biodegradable and bicompatiblePoly(caprolactonefumarate) (PCLF) was considered as a candidate for preparation of lymphoma targeted nanoparticulate drug delivery system because of its hydrophobicity.

The three synthesized PCLFs (named as PCLF530, 1250 and 2000) with different Mw and hydrophobicities were used to prepare nanoparticles (NPs) bynanoprecipitation method. The mechanism of doxorubicin HCL (Dox) release from PCLF NPs and the cytotoxicity and cellular uptake of them were investigated.

The spherical Dox loaded PCLF NPs with a diameter of 225 nm (with narrow size distribution) and a zeta potential of about -40 mV, showed a maximum release percent of 80% during 4 days with an initial burst release of about 20% in PBS pH 7.4, while in PBS pH 5.8 although the duration of release was the same 4 days but the maximum release percent was higher than that for pH 7.4. Empty PCLF NPs did not cause a considerable cytotoxicity on T47D, HT29 and 3T3NIH cell lines. The cytotoxicity of Dox loaded PCLF NPs on these cells were almost equal to the Dox solutions. Images showed T47D intracellular green fluorescent color after 48 hours incubation with FITC loaded PCLF NPs. In vivo images showed fluorescent signals of DiR in liver, spleen and other lymphatic tissues compared to the DiR solution, indicating the retention of DiR loaded PCLF NPs in such organs.

PCLF NPs beside their suitable size, surface charge and spherical shape, as a nanoparticulate drug delivery system, not only could load Dox and control its release, but also could be uptaken by T47D cells as model cell line in vitro and show considerable cytotoxicity on cells. Moreover, at in vivo experiments, they could be uptaken by lymphatic system cells and be retained there for two days.

Keywords: Poly (caprolactonefumarate) PCLF,Nanoparticles,In-vivo imaging